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NEW MITES OF THE PARASITIC GENUS HAEMOGAMASUS BERLESE.

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The genus *Haemogamasus* Berlese belongs to an ill-defined group of genera of the family Gamasidae, all of which are blood-sucking parasites of vertebrates. The genus is so nearly related to *Laelaps* Koch on the one hand and *Pachylaelaps* Berlese on the other that only with difficulty can a definition of it be given which will properly distinguish it from these two relatives. The following description of *Haemogamasus* is here offered: The genus includes those members of the family Gamasidae in which the dorsal shield is large and undivided in both sexes. In the female there are three ventral plates, the sternal, genito-epigastric and anal. The genito-epigastric plate never extends to or partially surrounds the anal plate. The anal plate is usually more or less triangular and nearly always bears but three setae, the two anterior of which are paired. The skin of the body is distensible and well clothed with rather short and almost uniform setae. The epistome is usually large and fringed with many chitinous projections. The chelicerae are stout and heavily toothed.

Members of this genus parasitize small mammals, and are particularly abundant on moles. Up to the present time only a single species truly representative of the genus has been described from North America. In the present paper six new species are described, all from North America.

By way of introduction and summary a key is here presented to all the North American species of *Haemogamasus* and also three exotic species which the writer has examined.

KEY TO SPECIES OF HAEMOGAMASUS EXAMINED BY THE WRITER.

1. Sternal plate of female provided with many setae, some of which are not arranged in definite pairs.....2.
Sternal plate of female provided with only four or six setae which are arranged in pairs.....3.
2. Number of sternal setae about 30; epistome irregular in outline.....
H. hirsutus Berlese.
Number of sternal setae less than 20; epistome large, regular in outline.....*H. alaskensis*, new species.
3. Sternal plate of female rectangular and with only four setae; anal plate egg-shaped in outline.....*H. americanus* Banks.
Sternal plate of female not rectangular and provided with six setae.....4.
4. Sternal plate of female inverted U-shape, each process of the "U" being longer than the width of the sternal plate itself.....
H. oudemansi Hirst.
Sternal plate of female not inverted U-shaped.....5.
5. Chelicerae with long, piercing arms, as in the genus *Liponyssus*.....
H. liponyssoides, new species.
- Chelicerae with stout, toothed, biting arms.....6.
6. Length considerably over 1 mm.; arms of chelicerae of female very short, stout, furrowed and heavily toothed.....*H. horridus* Michael.
Length about 1 mm. or less; arms of chelicerae not furrowed and heavily toothed.....7.
7. Fixed arm of chelicera of female longer than the movable arm.....
H. reidi, new species.
Fixed arm of chelicera of female either shorter or subequal to movable arm.....8.
8. Epistome oval in general outline; marginal teeth for the most part simple.....*H. barberi*, new species.
Epistome not oval in outline; most of the marginal teeth branched, those on front margin with two or more branches.....9.
9. Genito-epigastric plate broader than the distance between the posterior coxae.....*H. microti*, new species.
Genito-epigastric plate not equal in width to the distance between the posterior coxae.....*H. twitchelli*, new species.

Haemogamasus alaskensis, new species.

Female.—Epistome triangular in outline, with long marginal teeth, most of which are bifurcate. Chelicerae short and toothed. Dorsal plate covering the anterior part of the body entirely but leaving a rather narrow margin around the abdomen uncovered. Body moderately well clothed with subequal setae. Sternal plate broader than long with both the anterior and posterior margins incurved. Two pairs of sternal pores present; anterior pair slit-like, near the anterior margin of the sternal plate and parallel to it; posterior pair consisting of two oblique slits situated slightly behind the middle of the sternal plate and near its lateral margin. Sternal setae of two sizes. The six lateral ones, which are larger than the others,

are arranged in two parallel rows. The remaining smaller setae, which number about fourteen, are not arranged in definite pairs. Genito-epigastric plate small, but at its broadest place broader than the distance between the posterior coxae. Anal plate broadly and evenly rounded in front and strongly pointed behind. Anus situated its greatest diameter from front margin of anal plate. Paired anal setae about equal to the unpaired anal setae and situated opposite the middle of the anus. First pair of legs slightly shorter than the last pair. Second pair of legs equal to the third pair in length, but slightly stouter. None of the coxae provided with a tooth-like spine.

Length, 1.12 mm.; width, 0.70 mm.

Male.—Not known.

Type host and type locality.—From *Microtus* sp. taken on Crater Mt., Ophir, Alaska.

Type.—Cat. No. 947, U. S. N. M.

Described from a single female taken from *Microtus* sp. at Crater Mountain, Ophir, Alaska, July 23, 1924, by A. H. Twitchell. This species is nearest *H. hirsutus* Berlese, but is much smaller than Berlese's species and has only about one-half as many sternal setae. The epistome also is different from that of *H. hirsutus* Berlese.

***Haemogamasus liponyssoides*, new species.**

Female.—Palpi rather small, reaching to the middle of anterior femora; last segment with a large, deeply forked spine on inside. This spine is almost straight and not swollen. Epistome slender, with long simple teeth. Chelicerae very slender and adapted for piercing; fixed arm needle-like but curved; movable arm stouter, straight and blunt-pointed. Dorsal plate not completely covering the body even in the region of cephalothorax and leaving a wide margin between it and the edge of the abdomen. Body densely clothed with short, subequal setae. Sternal plate broader than long and broadest at the posterior end; anterior margin straight, posterior margin deeply notched. Sternal pores oblique slits situated midway between the second and third pairs of sternal setae. Sternal setae long, straight, subequal; first pair situated almost on the anterior margin of the sternal plate; second pair situated outside of lines drawn from first to third pairs; third pair situated farther from the second pair than the second pair is from the first pair. Genito-epigastric plate small, not equal in width to the distance between the posterior coxae and not extending to the middle of the abdomen. Anal plate egg-shaped in outline, broadly and evenly rounded in front and very narrow toward the tip. Anus moderate, rim thickest in front; it is situated more than its greatest diameter from the anterior margin. Paired anal setae scarcely as long as unpaired seta; situated opposite the middle of the anus; unpaired anal seta situated about half way from the anus to the tip of anal plate and extending beyond it for over one-half its length. Legs long; first pair longer than the total length of the body and about equal to the last pair; second pair equal in length to the third pair but slightly stouter.

Length, 1.08 mm.; width, 0.72 mm.

Male.—Somewhat smaller than female. Fixed arm of chelicera shorter, stouter and not needle-like. First three pairs of sternal setae very long and slender.

Length, 0.85 mm.; width, 0.50 mm.

Type host and type locality.—From *Scalops argentatus* taken at Ames, Iowa.

Type slide.—Cat. No. 948, U. S. N. M.

Described from one male and several females taken from a mole, *Scalops argentatus*, at Ames, Iowa, July, 1916, by J. E. Guthrie. This species has strong affinities with the genus *Liponyssus* which are shown in the piercing mouth-parts, the small genito-epigastric shield, the shape of the anal plate and the reduced dorsal plate.

Haemogamasus reidi, new species.

Female.—Chelicerae strongly toothed; movable finger slightly shorter than the fixed one. Seta on chelicera simple, not inflated and strongly incurved. Dorsal plate covering all the body dorsally except for a narrow lateral margin. Body moderately well clothed with short, subequal setae. Sternal plate broader than long, front margin almost straight, but hind margin strongly arched. In front of coxa I and between coxae I and II there are spike-like chitinous projections from the sternal plate which extend from it to the walls of the coxal cavities. First pair of sternal pores slit-like, situated slightly behind and inward from the first pair of sternal setae; second pair of sternal pores curved slits, situated half way from the second to third pair of sternal setae and slightly inside a line drawn from one to the other pairs of these setae. Sternal setae subequal and arranged in two divergent longitudinal rows. Genito-epigastric plate scarcely as broad as the sternal region between the last pair of coxae, and extending about half way to the anal plate. Anal plate almost circular except for the posterior scobinate region which extends as a broad median projection about as long as the greatest diameter of the anus. Anus situated centrally. Paired anal setae situated opposite the center of anus, half way from the anal rim to the lateral margin of anal plate; unpaired anal seta longer than paired ones and situated entirely in front of scobinate area. First and last pairs of legs about equal and longer than the other two pairs. The antero-ventral margin of each coxa bears a comb of minute teeth, one of which in the case of coxae II and IV is larger than the rest.

Length, 0.83 mm.; width, 0.48 mm.

Male.—Not known.

Type host and type locality.—Host (?). Type locality, Forestville, Maryland.

Type slide.—Cat. No. 949, U. S. N. M.

Described from seven females taken from a squirrel's nest, April 21, 1924, by E. D. Reid. The relationships of this species are indicated in the key to species given in this paper.

Haemogamasus barberi, new species.

Female.—Epistome large, oval, longer than broad; marginal teeth simple on the sides of epistome but branched on the front margin of the same.

Dorsal shield very large, practically covering the dorsal surface of the body. Body setae short and numerous, subequal. Peritreme very long, extending almost to rostrum and about straight except for the shoulder bend. Sternal plate broader than long and broadest near posterior margin; sternal pores oblique slits situated very near the first pair of setae, but inside and posterior to them. Six sternal setae, arranged in two posteriorly divergent rows near the lateral margins of sternal plate; first pair slightly smaller than the other two pairs. Genito-epigastric plate large, extending backward to about the middle of the abdomen; at its widest place this plate is wider than the distance between the posterior coxae. Anal plate small; anus large, situated about four-fifths its greatest diameter from the front margin of the anal plate; paired anal setae smaller than the unpaired anal setae and situated slightly posterior to the level of the front margin of anus; unpaired anal seta extending for fully half its length beyond the tip of anal plate. Legs moderate; first pair much longer than the second but hardly as stout.

Length, 1.07 mm.; width, 0.78 mm.

Male.—Unknown.

Type host and type locality.—From "nest of small mammal," Maryland shore of Potomac River, near Plummer Island.

Type slide.—Cat. No. 950, U. S. N. M.

Described from two females, which together with one nymph and three Gamasid mites of a different genus were mounted on the same microscope slide. This species is quite different from any of the described ones of its genus but is rather closely related to a new species taken from *Microtus* sp. In this latter species from *Microtus* the epistome is not oval in outline, and most of its marginal teeth are large and branched, whereas in *H. barberi* most of them are small and simple.

***Haemogamasus microti*, new species.**

Female.—Epistome large and long, almost as broad at its tip as at its base; teeth branched, those on the front margin several times branched. Chelicerae short with curved tips to the arms. Dorsal shield completely covering the body in front and almost covering it behind. Body well clothed with short setae which increase somewhat in length toward the posterior end. Sternal plate broader than long and broadest between the second and third coxae. Sternal pores a pair of straight, oblique slits approximate to the anterior sternal setae. Sternal setae six in number, subequal and arranged almost in two rows. Genito-epigastric plate large, broader than the distance between the posterior coxae. Anal plate rather small, anterior margin broadly and evenly rounded. Anus large, situated about one-half its greatest diameter from the anterior margin of the anal plate. Paired anal setae situated on a level with the center of the anus; unpaired seta situated at about one-half the distance from the posterior margin of anus to the tip of anal plate. Legs rather stout; posterior pair slightly longer than the anterior pair; second the stoutest and shortest. The femora of second pair of legs are about three-fourths as broad as long.

Length, 1.05 mm.; width, 0.72 mm.

Male.—Not known.

Type host and type locality.—From *Microtus pennsylvanicus*, Bronxville, New York.

Type slide.—Cat. No. 951, U. S. N. M.

Described from two females taken by Dr. R. C. Murphy, February 19, 1924, from *Microtus pennsylvanicus* at Bronxville, New York. This species is related to *H. barberi*, new species, but differs from that species in the shape and character of the epistome, in the shape of the anal plate and in a few other characters.

Haemogamasus twitchelli, new species.

Female.—Epistome large, much longer than broad, with conspicuous marginal dentations, most of which are two or three pronged. Chelicerae stout, almost straight and strongly toothed. Dorsal plate almost covering the entire body and well clothed with subequal setae. Sternal plate broader than long; front margin slightly incurved and posterior margin strongly so. Front pair of sternal pores straight slits situated inward and behind the first pair of sternal setae; second pair of sternal pores diagonal slits about midway between the second and third pairs of sternal setae, but not directly between these two pairs of setae. Sternal setae long, slightly curved and arranged in two slightly divergent longitudinal rows. Genito-epigastric plate reaching about half way to anal plate, not as broad as the distance between the posterior coxae, bearing a large number of irregularly placed setae. Anal plate almost circular except for a posterior, median projection which is triangular. Anus with six paired and two unpaired setae; almost at the front margin on the median line is situated the first unpaired seta and slightly in front of the scobinate area on the median line is situated the second unpaired seta; the first paired setae are situated slightly behind the first unpaired one, the second paired setae behind and lateral to the first pair, while the third paired setae are situated laterally from the center of the anus. Last pair of legs the longest and slenderest; second pair somewhat enlarged. The anterior distal margin of each coxa has a minute comb of teeth, but none of them is provided with a toothed spine.

Length, 0.89 mm.; width, 0.51 mm.

Male.—Smaller than the female. Ventral arm of chelicera greatly modified. It consists of an inner and outer process. Inner process a stout, strongly curved, distally bifurcate claw-like structure; outer process much longer than the inner, strongly incurved and ending in a knob. Dorsal arm of chelicera of the usual type, strongly curved at the tip with a slight indication of two or three minute teeth. Galea ending in two subequal knob-like lobes. Third segment of palpus with a stout, simple, curved spine on the inside. Inner spine of last segment of palpus slightly curved and split to its base. Posterior pair of legs not so stout as in the female and decidedly the longest and slenderest of the four pairs.

Length, 0.68 mm.; width, 0.48 mm.

Type host and type locality.—From Dawson red-back mouse, *Eutamias dawsoni*, taken at Crater Mountain, Ophir, Alaska.

Type slide.—Cat. No. 952, U. S. N. M.

Described from six females and one male taken by A. H. Twitchell in Alaska; one female and one male (holotype) taken from Dawson red-back mouse at Crater Mountain, Ophir, Alaska, and five females taken from a vole (exact locality?).

This species is very distinct in the peculiar shape of the chelicerae of the male and in having more than three anal setae on the female anal plate.